



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
REGION 5  
77 WEST JACKSON BOULEVARD  
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF: SR-6J

17 February 2005

Jerry C. Winslow, P.E., J.D.  
Principal Environmental Engineer  
Xcel Energy (on behalf of NSP-Wisconsin)  
414 Nicollet Mall (Ren. Sq. 8)  
Minneapolis, Minnesota 55401

Re: Ashland/NSP Lakefront Superfund Site  
Remedial Investigation Field Work  
Proposed Well Abandonment & Installation of Replacement Wells

Dear Mr. Winslow:

During our technical conference call on January 5, 2005, you alerted the Agencies to the possibility that the presence of greater levels of free product than usual (based upon the quarterly monitoring results over several years) in a number of monitoring wells may be indicative of the contaminants within the groundwater degrading the bentonite seals of the wells and allowing free-product to enter the well screen, and also serving as an easy conduit for contaminant migration.

Your consultants have advised that since limited free-product is evident in well MW-2AR and not yet evident in deeper wells at this location, no further course of action is necessary, at this time (since there is an upward hydraulic gradient). At location MW-4B, however, your consultants have advised that well abandonment and replacement is necessary at this time.

It is reasonable to conclude that a downward hydraulic gradient could contribute to a faster migration of contaminants into deeper zones, which could explain what we currently know about the contaminant plume configuration. If the assumption is that the bentonite seal is compromised at some locations, it would make sense to assume that the bentonite seal at all wells that intersect high levels of contamination are also potentially compromised.

EPA is not suggesting that all of the data we have been collecting has been compromised, and certainly not at all locations. At this time, EPA is offering a different assessment of the data for you to consider and options for resolving the outstanding questions and issues related to NAPL migration.

It is well known that certain contaminants can impact the performance and integrity of bentonite and plastics. It is a good practice to consult with the manufacturers regarding the material's compatibility with various substances prior to well installation.

The wells in question were installed approximately one decade ago. In a technical report entitled "*Nonaqueous Phase Liquids Compatibility with Materials Used in Well Construction, Sampling, and Remediation*" (EPA/540/S-95/503, July 1995), the compatibility of NAPLs with materials used in well construction is discussed. Information provided in this report was derived from field experience and available data from the published literature. It is a complex issue and is dependent upon many factors including temperature, pH, the constituents comprising the NAPL, and the pressure, to name a few. However, regardless of the compatibility of well materials with contaminants present at the site, the fact remains that a complete, 100% seal of a well annulus is technically unachievable when the well intersects NAPL. This is primarily due to the fact that the driving force for contaminant migration is density and the presence of preferred pathways, such as the annulus of a well.

It seems easy to surmise that wherever we have wells and piezometers that do not intersect DNAPL pools or high concentrations of contaminants, it is likely that the bentonite and PVC may still be intact. In locations where a DNAPL pool was intersected, we might have a problem, but installation of new wells and abandonment of old wells will only enhance the potential for the vertical migration of DNAPL at the site.

The situation concerning DNAPL migration is even more complicated than this. Contaminants, including those present in NAPLs, interact not just with bentonite placed into the formation for well construction (which itself is a plastic, colloidal clay largely composed of the mineral sodium montmorillonite, a hydrated aluminum silicate) but also with the natural geologic formation itself, such as the clays and silts comprising the Miller Creek Formation. The question to consider at this time is: are we seeing the product in the deeper wells because:

- The bentonite and or the PVC material is being subject to chemical changes from the contaminants;
- The clay and silt within the natural formation is losing its "hydraulic barrier" characteristics because of its interactions with the contaminants;
- The clay and silt within the natural formation is not homogeneous and contains sand seams that are permeable;
- The well annulus simply cannot be completely sealed when in contact with these types of chemicals; and/or
- Is all of this occurring?

It appears, based on the dissolved phase concentrations reported in the Cooper Falls Formation, which are greater than the expected effective solubilities of individual and combined chemical species (thus indicating the presence of DNAPL), that DNAPL has moved into the Cooper Falls Formation through the Miller Creek Formation (URS, August 24, 2004, Figure 5, Cross Section A-A'). The boring log, which corresponds with well MW-4B indicates that DNAPL had reached an area near the MW-4B well screened interval before installation of the well. A strong odor and black staining was reported from a depth of 40.5 to

45.0 feet bgs in this boring.

Based on EPA's experience at many DNAPL sites, the Miller Creek Formation may indeed act as a hydraulic barrier, but it is unlikely that it represents a barrier to DNAPL migration. Migration of DNAPL is influenced primarily by density, differences in capillary pressure, and the presence of preferred pathways (e.g., a well annulus, sand seams within the clay layer, dessication cracks and microfractures formed after the clay was first deposited). Sand seams were noted within this clay in the borings for MW-4B, at a depth of 40 feet below ground surface (bgs).

Because hydraulic control will not likely control the downward movement of DNAPL, and it seems clear that DNAPL is already present in this location, and it appears that these permanent well installations in a location with a DNAPL pool may create more problems, it isn't clear to the Agency why another well at this location would be the appropriate response to this particular situation.

EPA agrees that it is important to characterize the extent of DNAPL for purposes of evaluating potential risks to human health and the environment and to evaluate potential remedial options. However, there are other methods which will be more effective, based on what we now know about the site and techniques successfully used on similar sites: downhole sensors and soil borings. Further, in contemplating potential remedial options, it is evident that to remove or treat DNAPL, a system that is more aggressive than a simple hydraulic control system or pump and treat alternative will likely need to be evaluated in the feasibility study.

Therefore, installation of additional conventional wells is not recommended at this time, in this location. As previously stated, installation of additional wells here will only exacerbate the problem. Because product will likely migrate primarily along the annuluses of wells, traditional abandonment of the wells in question will also not prevent the downward migration of product.

Discussions this week also included our position that pressure testing the wells may be a viable option here. However, after additional consideration, we no longer believe that would resolve any questions, because of the bentonite seal issue, previously discussed. Also, while we do not believe that the casing of the wells have actually been breached by product, it is likely that the casings may indeed have been weakened by exposure to product. Therefore, pressure testing should no longer be considered an option. EPA highly recommends that product be removed from the wells and that the product recharge rates measured and evaluated. No new wells should be considered for installation in the product zone now or in the future unless they are directly tied to implementation of a proposed remedy.

In sum, EPA recommends removing product from any and all wells where it is found in substantial quantities on a regular if not continuous basis to determine product recharge rates, and utilize this information to assess the need for a long term product removal system (which is consistent with the work that needs to be performed for the feasibility study). Additional wells should not be installed until their utility in relationship to a potential remedy can be clearly established and their design adjusted accordingly. The last quarter of ground water monitoring data will be collected in March. As we

analyze this data, and consider the information from the recharge rates of product at this well location, EPA recommends that we further discuss our options; for example, utilizing a technology such as direct push sensing (instead of conventional monitoring wells) to be used in the product area to further define the nature and extent of the DNAPL plume for the purposes of the feasibility study.

Sincerely yours,

Sharon Jaffess, Remedial Project Manager  
Superfund Division